

## Excretory Cystograms After Voiding

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MANY pathological conditions of the upper urinary tract and bladder can be diagnosed and differentiated by excretory urography, not only from morphological deviation, but particularly by a study of the peristaltic action of the calyces, kidney pelves and ureters and the emptying power of the kidney and bladder.

In order to get the best results it is necessary: (1) to prepare the patient by dehydrating sufficiently to get a better concentration of the opaque solution in the urine, and (2) to clear the bowel of fecal material and gas. The most uniform results have been obtained by giving the patient instructions noted in Table 1.

TABLE 1.—*Instructions for Preparation for Excretory Urography*

1. Regular dinner the evening before the date set for the x-ray study.
2. No fluids and no food until after the x-rays are finished the next morning.
3. Two to four A. B. S. & C. Pills (Aloin, Belladonna, Strychnine and Cascara) at 9 p. m. the evening before, the number of pills depending on the patient's bowel activity.
4. If necessary, an enema one hour before the patient goes to the x-ray laboratory. No abdominal or pelvic binder or pressure bag should be used which might interfere with urinary peristalsis.

The next important step is that the proper technique be followed by the x-ray technician. The minimum study is indicated in Table 2.

TABLE 2.—*Technique for Making Adequate Studies in Excretory Urography*

Films of the urinary tract to be taken as follows:

1. Before the intravenous injection of the opaque solution.
  2. Three to five minutes after the intravenous injection.
  3. Fifteen minutes after injection.
  4. Twenty-five minutes after injection.
  5. In standing position (immediately after film 4). It should be taken after a few deep breaths while standing.
  6. After voiding (a film taken through bladder region). Instruct the patient to empty the bladder completely.
- All exposures except the last one on the list should be on 14 x 17 films for study of the entire urinary tract, including the bladder. The last exposure listed (6) through the bony pelvis after voiding, for the bladder region, should be on an 8 x 10 film.

The foregoing serves as an excellent routine technique for x-ray technicians to follow, but for a more accurate study the roentgenologist should study the first two or three urograms and note the rapidity of concentration of the opaque solution in the urinary tract, particularly the increasing density of it in the

bladder. Then he can either lengthen or shorten the intervals for the suggested 15 and 25-minute films. In general the techniques noted in Tables 1 and 2 should be followed, but if concentration is slow in one or both kidney pelves, films should be made over longer periods such as an hour or two. Also, for greater accuracy, stereoscopic films should be made of Numbers 1, 3 or 4 (Table 2), according to the concentration of the opaque solution, and of Number 6.

There are thousands of excretory urograms taken by improper and insufficient technique, leading to wasting of films and failure to make an accurate diagnosis of disease. Since this report stresses particularly study of the cystogram taken after voiding, the cases presented here have been chosen because in them the most valuable diagnostic clue was given by that cystogram.

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### GROUP 1. Lower urinary tract obstruction.

Figures 1 and 2. Contracted bladder neck evidenced by a collection of opaque urine in the retrotrigonal pouch behind the hypertrophied interureteric ridge and also in the anterior pouch of the vertex of the bladder. The author considers this sign to be the one most valuable in diagnosis and the one most frequently seen. It always indicates urethral obstruction,

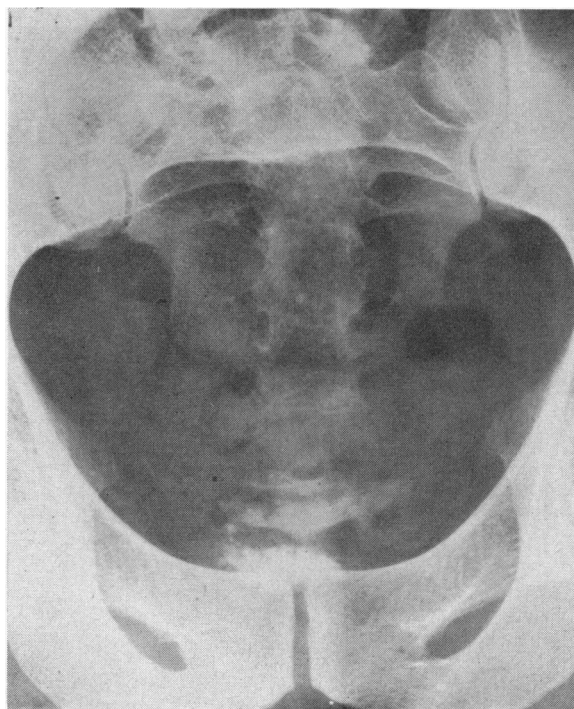


Figure 1

\* From the Division of Urology, Stanford University Medical School, San Francisco.

particularly that of a fibrous contracted bladder neck in both sexes. In the male it also indicates median bar or early hypertrophy of the prostate, particularly in young adults and middle aged men. I think roentgenologists should become acquainted with this sign and include it in their reports, as it is often indicative of the cause of vague complaints of illness and gastro-

intestinal disturbances, without particular urinary tract symptoms at the time.

Figure 3. Contracted bladder neck with more residual urine and a chronic colon bacilluria which did not clear up under extensive chemotherapy until the base of the bladder neck had been grooved and followed by a few Kollman dilatations of the posterior urethra.

Figure 4. Stricture of the membranous urethra evidenced by residual urine in the bladder, too much to show the above mentioned signs.

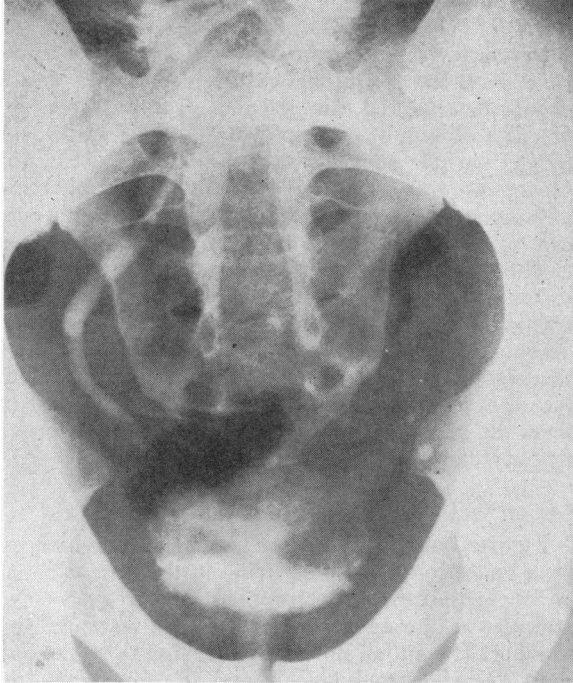


Figure 2

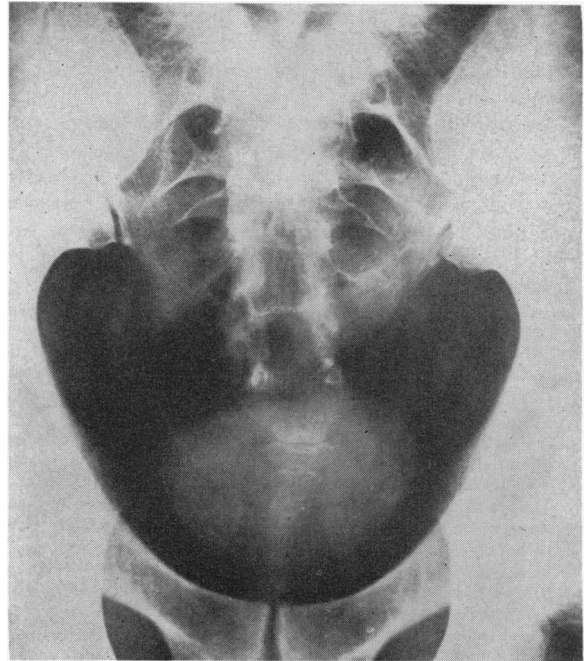


Figure 4

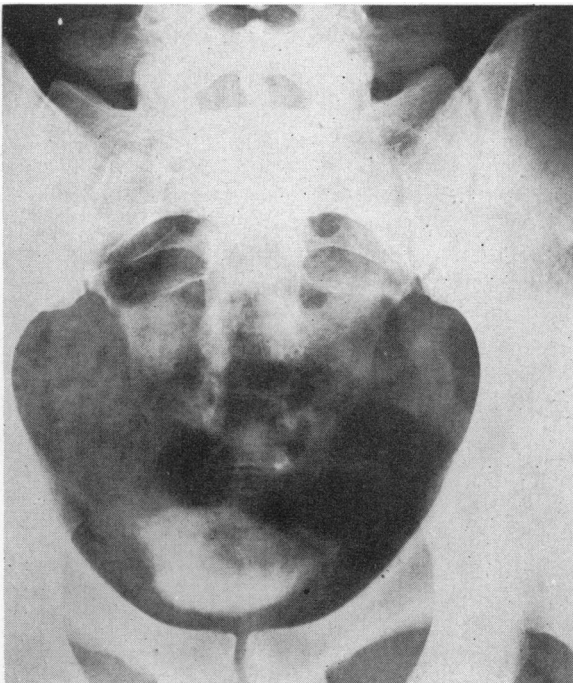


Figure 3

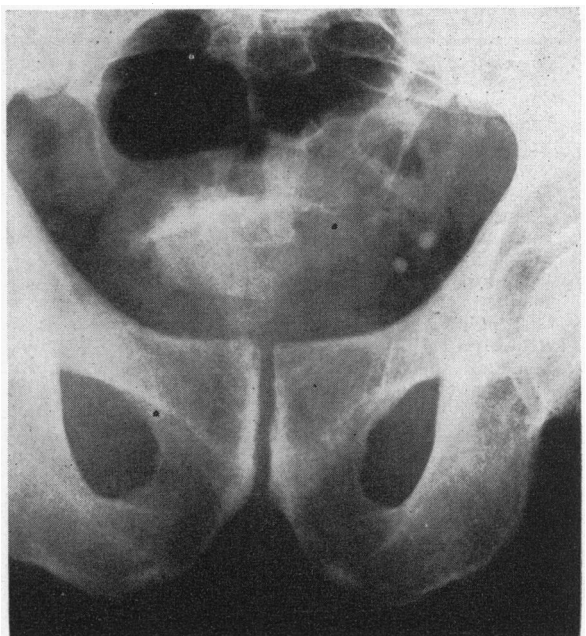


Figure 5

GROUP 2. Hypertrophied prostate, showing characteristic shadow (where there is not a great deal of residual urine) of a rounded mass causing a filling defect in the floor of the bladder in the region of the prostate. The following cases were less characteristic:

Figure 5. Residual urine was absent, but the ureter is being pushed upward and backward and this is



Figure 6

evidence of a mass in the region of the prostate or floor of the bladder.

Figure 6. The preliminary films showed several stones 1 cm. or so in diameter in the bladder, but the excretory cystogram showed a tremendously hypertrophied bladder wall, with a small diverticulum. The bladder emptied completely although there was evidence of a tremendously hypertrophied prostate by the displacement of the ureter upward and backward. At operation 50 gm. of prostatic tissue was removed transurethraly, after which 12 stones were crushed and washed out.

Figure 7. Evidence of a large residual of urine and suggestion of a large prostate, which had preoperatively been diagnosed as malignant. At operation a primary malignancy of the bladder was found, with invasion of the prostate and infiltration around the seminal vesicles.

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GROUP 3. Women with residual urine.

The normal nulliparous female bladder empties completely, though occasionally it may show just a few drops of residual urine with no characteristic outline in the region of the bladder neck. If a tendency to contracture of the bladder neck exists, it results in a cystogram similar to that noted in Figure 1.

Figure 8. A small amount of irregularly distributed residual urine, indicative of early trabeculation and bladder irritability—in this case due to polyps around the bladder neck.

Figure 9. A small amount of residual urine with a tremendously hypertrophied bladder wall. The patient was a 26-year-old nun with a long history of urinary frequency, incontinence, and pain with a



Figure 7

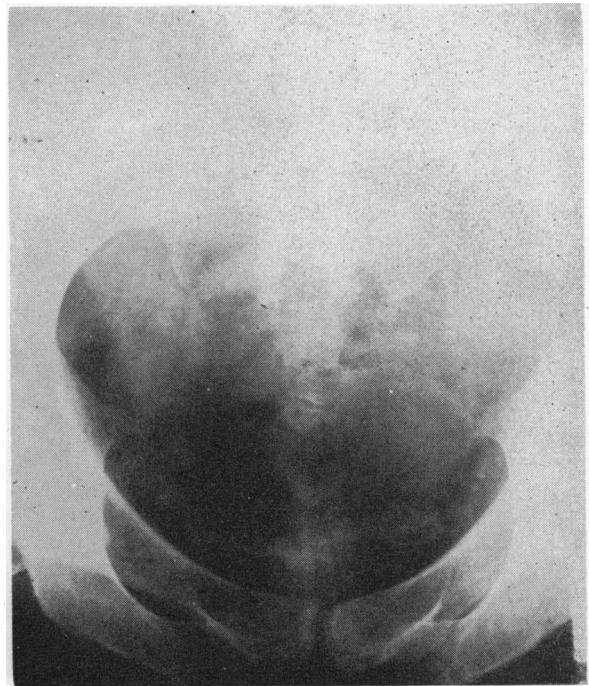


Figure 8

full bladder which was relieved by voiding. These symptoms were typical of Hunner ulcer, which was found and permanently cured by several treatments of overdistending the bladder.

Figure 10. A large unsuspected residual of 400 cc.

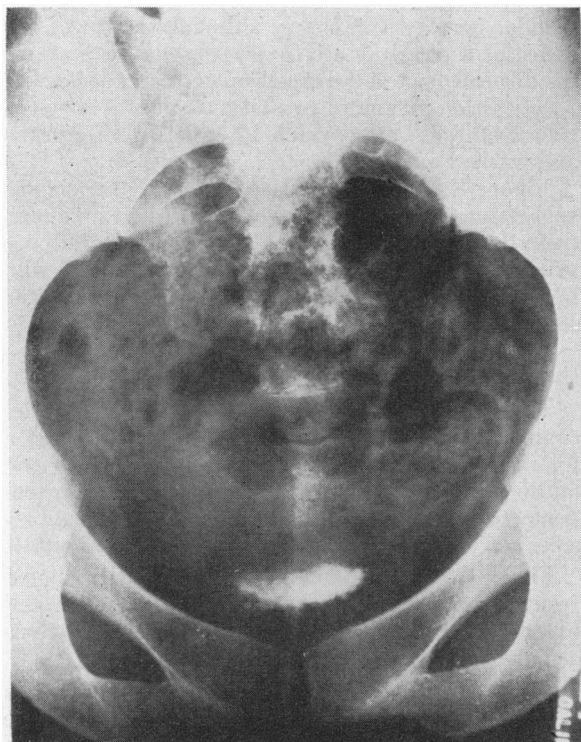


Figure 9

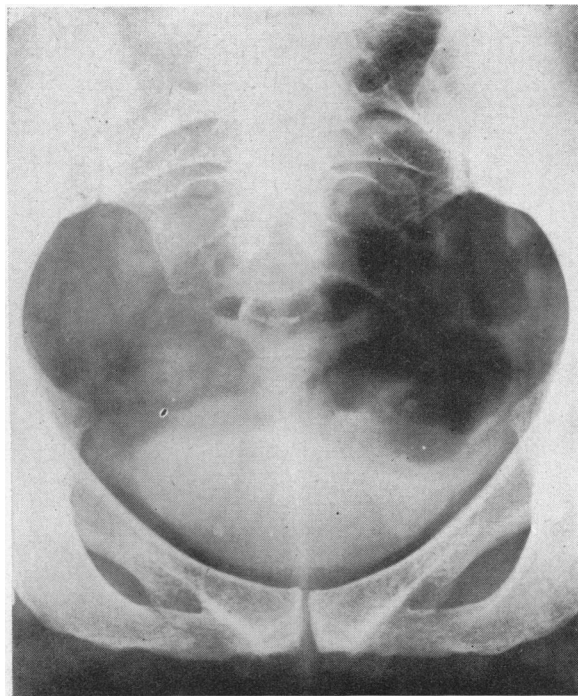


Figure 10

of urine in a female, the mother of three children, who had been treated for nervousness for years. She had had previous excretory urograms, as well as cystoscopic examinations, and a residual urine never had been determined previously. She had very little evidence of a cystocele, but a contracted bladder neck was present. Since operation was refused, several urethral dilatations with a Kollman dilator were carried out and gave a great deal of symptomatic relief. Subsequently the urine became clear and bladder symptoms disappeared.

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GROUP 4. Filling defects of the bladder not due to primary neoplasm.

A negative excretory cystogram does not exclude the possibility of neoplasm of the bladder, and it is to be emphasized that there is positively no excuse for not cystoscoping every patient with hematuria and making an attempt at early discovery of its source. Most bladders with moderate sized neoplasms can empty completely unless the bladder neck is involved in such a way as to cause residual urine. If there is no residual urine, the filling defects are best noted in the preliminary series of films, all of which should include the bladder, as was emphasized in the outline on technique in Table 2.

Figure 11. Filling defect in the region of the right seminal vesicle due to a large retroperitoneal abscess, which started from osteomyelitis of the lumbar vertebrae pointed in the costovertebral angle, causing fixation of the right kidney and extending down into the pelvis on the right side of the bladder. The clinical picture was characteristic of a perirenal abscess.

Figure 12. Excretory cystogram of the same patient (Figure 11) two months after drainage of the

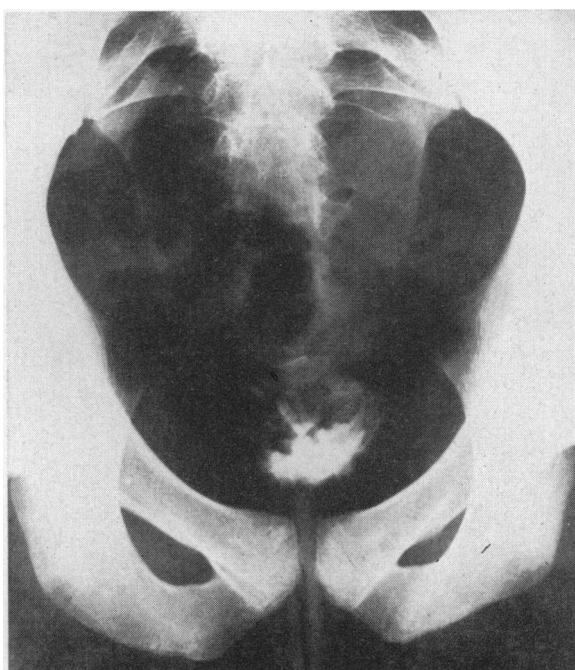


Figure 11



abscess, apparently stenosing the orifices of the seminal vesicles and leaving them in a dilated cystic condition, showing as a characteristic outline. The ureters are pushed upward to some extent.

Figure 13. Filling defect of the bladder caused by a large diverticulum, not diagnosed until the patient was cystoscoped. The fact that there is residual urine indicates bladder neck involvement, which was found

to be of a fibrous contracted type. This film also shows that a diverticulum does not fill unless the orifice is large enough to admit the diffusion of the opaque urine.

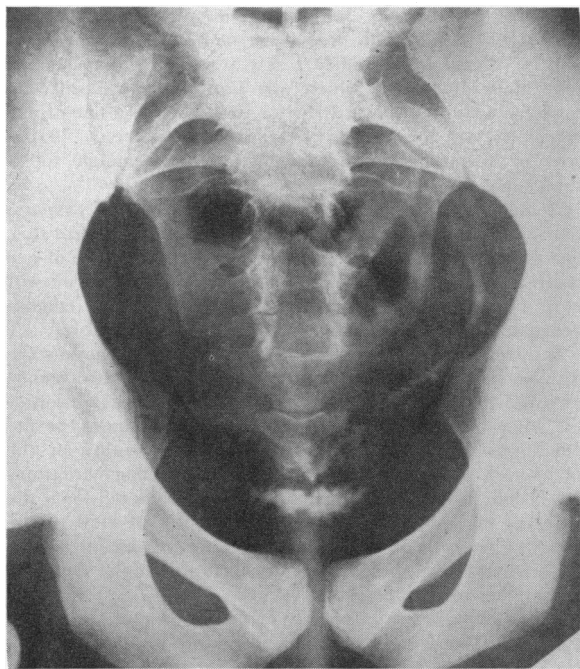


Figure 12

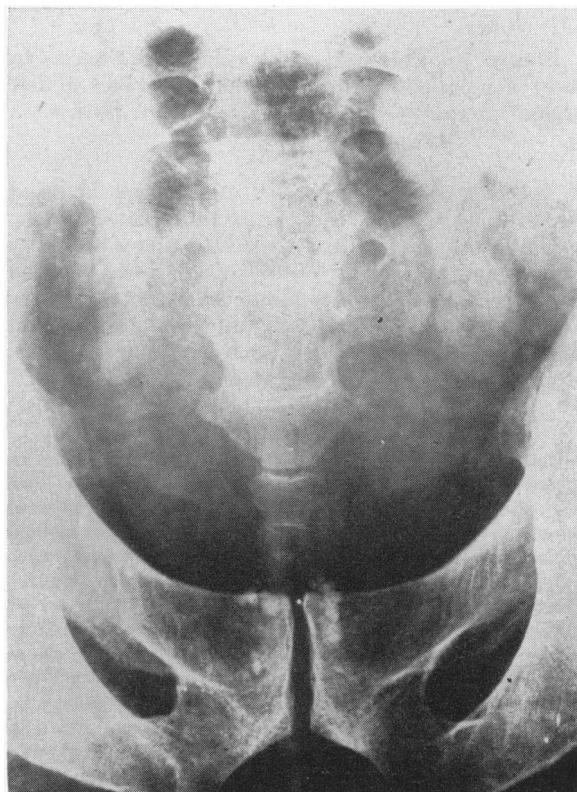


Figure 14

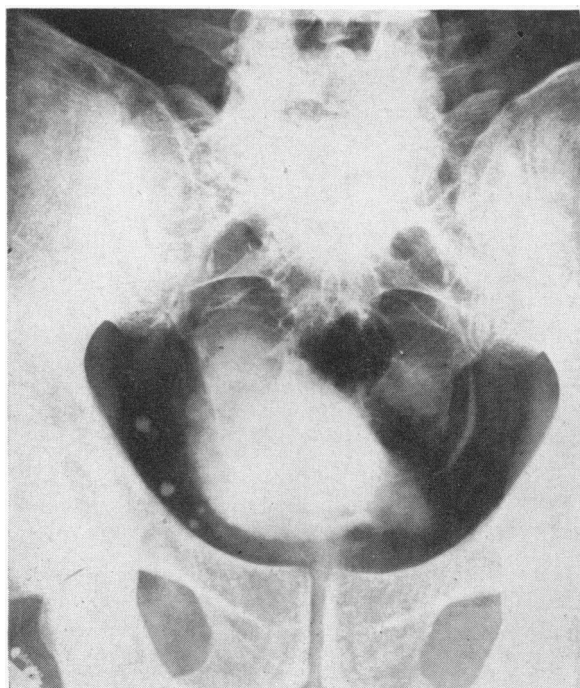


Figure 13



Figure 15

GROUP 5. At times the lower ends of the ureters are best visualized and studied in excretory cystograms.

Figure 14. This film shows the ureters dilated to the bladder wall, due to chronic vesiculitis and prostatic stones.

Figure 15. This is the only film in the series to show a non-opaque stone in the lower end of left ureter, later delivered with Council Stone Basket.

#### SUMMARY

Not only should filling defects be kept in mind and studied in after-voiding excretory cystograms, as indicative of hypertrophied prostates, bladder tumors and pressure from outside sources, but also attention must be paid to the developmental changes in the bladder wall resulting from obstruction and from abnormal stimulation such as urethral polyps, Hunner ulcers, cystitis, and stones.

#### DISCUSSION BY A. M. MEADS, M.D.

Doctor Dillon's paper has emphasized to me a step in intravenous urography that for the most part I have been neglecting. So partial have I been to retrograde studies of the urinary tract due to the abuse of the intravenous method in the hands of the rank and file that I have used intravenous urography only as an adjunct to the retrograde studies. Personally I would not operate upon a case diagnosed by intravenous pyelographic evidence only, unless the findings were positive without the shadow of a doubt and the use of the retrograde method impossible. About two years ago within an interval of a few months we picked up two symptomless papillary carcinoma of the bladder while investigating cases of hypertrophied prostate. I am sure anyone would have missed these tumors if a cystoscopic investigation had not been carried out. Pyelographic fluid not infrequently obscures soft stones that have been interpreted by the

roentgenologist as intestinal shadows, but which are revealed in their true relationship to the bladder by the cystoscope. Having a patient void during an examination is not always a simple matter, especially when he has been without fluids for a few hours and is of a nervous temperament. Such patients after a struggle may void only a small amount, leaving enough in the bladder to be misinterpreted as a residual when it is not.

If Doctor Dillon has solved the gas prob'lem in intravenous urography, I congratulate him. This is not so important of course in bladder plates, but it often obscures the pel'ves and ureters on one or both sides just sufficiently to prevent a positive diagnosis. Recently I saw a so-called renal tumor scheduled for surgery which was proved to be normal by retrograde studies. I heard Doctor Braasch say in one of our recent prewar conventions that he considered only 40 per cent of intravenous urograms satisfactory enough for a complete diagnosis.

Doctor Dillon has emphasized the importance of preparation before x-ray films are taken. All urologists realize this, but many internists and general men do not. In spite of our routine that is supposed to free the intestine of gas, we still have many unsatisfactory films. We have avoided enemas because they seem to add insult to injury at times.

Intravenous urograms are either good or bad. The less the disease, the better the film is apt to be. At best, intravenous urography never tells the whole truth as to the condition of the kidney urine, the true function of the kidneys, or the conditions of the mucosa of the posterior urethra or the bladder. I feel, therefore, that when intravenous urograms are ordered their limitations should be considered from the point of view of a diagnosis and the point of view of the patient's pocketbook. Most patients, after paying for a complete intravenous study, wonder why the urologist demands a complete retrograde study.

These remarks are in no way critical of Doctor Dillon, for I know that he uses intravenous urography in selected cases. He has emphasized to me the part of my intravenous studies that I have neglected, namely, the last film showing the bladder after the patient has voided.

